



DOE-EM/GJ675-2004

## C4549 Log Data Report

### Borehole Information:

<b>Borehole:</b> C4549		<b>Site:</b> 216-U-1 & 2 Cribs			
<b>Coordinates</b> (WA State Plane)		<b>GWL (ft)<sup>1</sup>:</b> Dry		<b>GWL Date:</b> 05/28/2004	
<b>North</b>	<b>East</b>	<b>Drill Date</b>	<b>TOC<sup>2</sup> Elevation</b>	<b>Total Depth (ft)</b>	<b>Type</b>
Not Available	Not Available	May 2004	Not Available	50	Push Hole

### Casing Information:

<b>Casing Type</b>	<b>Stickup (ft)</b>	<b>Outer Diameter (in.)</b>	<b>Inside Diameter (in.)</b>	<b>Thickness (in.)</b>	<b>Top (ft)</b>	<b>Bottom (ft)</b>
Threaded steel	0.1	6 5/8	5 1/2	9/16	+0.1	50

### Borehole Notes:

Zero reference is the ground surface. Fluor FTL was source of the casing data.

### Logging Equipment Information:

<b>Logging System:</b> Gamma 2A		<b>Type:</b> SGLS (35%) 34TP20893A	
<b>Calibration Date:</b> 03/2004		<b>Calibration Reference:</b> DOE-EM/GJ642-2004	
		<b>Logging Procedure:</b> MAC-HGLP 1.6.5, Rev. 0	

<b>Logging System:</b> Gamma 2F		<b>Type</b> NMLS (H380932510)	
<b>Calibration Date:</b> 09/03		<b>Calibration Reference:</b> GJO-2003-520-TAC	
		<b>Logging Procedure:</b> MAC-HGLP 1.6.5, Rev. 0	

### Spectral Gamma Logging System (SGLS) Log Run Information:

<b>Log Run</b>	<b>1</b>	<b>2</b>	<b>3 / Repeat</b>		
Date	05/28/04	05/28/04	05/28/04		
Logging Engineer	Spatz	Spatz	Spatz		
Start Depth (ft)	49.57	49.50	44.5		
Finish Depth (ft)	49.57	0.5	36.5		
Count Time (sec)	200	200	200		
Live/Real	R	R	R		
Shield (Y/N)	N	N	N		
MSA Interval (ft)	1.0	1.0	1.0		
ft/min	N/A <sup>3</sup>	N/A	N/A		
Pre-Verification	BA344CAB	BA344CAB	BA344CAB		
Start File	BA344000	BA344001	BA344051		

Log Run	1	2	3 / Repeat		
Finish File	BA344000	BA344050	BA344059		
Post-Verification	BA344CAA	BA344CAA	BA344CAA		
Depth Return Error (in.)	N/A	0	0		
Comments	Sonde tip is resting on bottom of borehole.	Fine-gain adjustment made after files 023, 042, and 047.	Repeat section.		

### **Neutron Moisture Logging System (NMLS) Log Run Information:**

Log Run	1	2 / Repeat		
Date	5/28/04	5/28/04		
Logging Engineer	Spatz	Spatz		
Start Depth (ft)	0.0	30.0		
Finish Depth (ft)	49.5	35.0		
Count Time (sec)	N/A	N/A		
Live/Real	N/A	N/A		
Shield (Y/N)	N/A	N/A		
MSA Interval (ft)	N/A	N/A		
ft/min	1.0	1.0		
Pre-Verification	BF177CAB	BF177CAB		
Start File	BF177000	BF177199		
Finish File	BF177198	BF177219		
Post-Verification	BF177CAA	BF177CAA		
Depth Return Error (ft)	N/A	0		
Comments	None	Repeat Section.		

### **Logging Operation Notes:**

Zero reference was ground surface. Logging was performed with a centralizer installed on the sonde. Pre- and post-survey verification measurements for the SGLS employed the Amersham KUT ( $^{40}\text{K}$ ,  $^{238}\text{U}$ , and  $^{232}\text{Th}$ ) verifier. The first SGLS spectrum (BA344000) was collected at the bottom of the borehole. The tool reached total depth at 49.57 ft.

### **Analysis Notes:**

<b>Analyst:</b>	Sobczyk	<b>Date:</b>	6/2/04	<b>Reference:</b>	GJO-HGLP 1.6.3, Rev. 0
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SGLS pre-run and post-run verification spectra were collected at the beginning and end of the day. All of the verification spectra were within the acceptance criteria. The peak counts per second (cps) at the 609-keV, 1461-keV, and 2615-keV photopeaks on the post-run verification spectrum, as compared to the pre-run verification spectrum for the day, were between 1.8 percent lower and 7.1 percent lower at the end of the day. The peak counts per second at 2615 keV showed the greatest variation of the KUT photopeaks on the post-run verification spectrum as compared to the pre-run verification spectrum. Examinations of spectra indicate that the detector functioned normally during logging, and the spectra are accepted.

Pre-run and post-run verification spectra for the neutron tool were evaluated and were within the acceptance criteria.

Log spectra were processed in batch mode using APTEC SUPERVISOR to identify individual energy peaks and determine count rates. The post-run verification spectrum was used to determine the energy and resolution calibration for processing the data using APTEC SUPERVISOR. Concentrations were calculated

in EXCEL (source file: G2AMar04.xls). Zero reference was the ground surface. The casing configuration was assumed as one string of 6-in. casing with a thickness of 9/16 in. to 49.57 ft (total logging depth). Dead time and water corrections were not required.

NMLS log spectra were processed in batch mode using APTEC SUPERVISOR to determine count rates. Zero reference was the ground surface. Moisture calibration models at Hanford for 6-in.-diameter casing with 0.28-in. thickness have been established. A casing thickness correction (relative to 6-in. casing) can be estimated. Thus, corrections were applied to the gross neutron counts per second to estimate volumetric moisture content with the 6-in. hole-size correction and the 9/16-in. casing thickness for 6-in.-diameter casing.

### **Log Plot Notes:**

Separate log plots are provided for gross gamma and dead time, gross gamma and volume fraction of water, naturally occurring radionuclides ( $^{40}\text{K}$ ,  $^{238}\text{U}$ , and  $^{232}\text{Th}$ ), and man-made radionuclides. Plots of the repeat logs versus the original logs are included. For each radionuclide, the energy value of the spectral peak used for quantification is indicated. Unless otherwise noted, all radionuclides are plotted in picocuries per gram (pCi/g). The open circles indicate the minimum detectable level (MDL) for each radionuclide. Error bars on each plot represent error associated with counting statistics only and do not include errors associated with the inverse efficiency function, dead time correction, or casing correction. These errors are discussed in the calibration report. A combination plot is also included to facilitate correlation. The  $^{214}\text{Bi}$  peak at 1764 keV was used to determine the naturally occurring  $^{238}\text{U}$  concentrations on the combination plot rather than the  $^{214}\text{Bi}$  peak at 609 keV because it exhibited slightly higher net counts per second.

### **Results and Interpretations:**

$^{137}\text{Cs}$  was the only man-made radionuclide detected in this borehole.  $^{137}\text{Cs}$  was detected at the ground surface (0.5 ft) with a concentration of 0.9 pCi/g. Photopeaks at 1001 keV, which is indicative of  $^{238}\text{U}$ , were apparent at 43.5 ft on both the original and repeat log runs. However, the APTEC software did not identify these photopeaks as being statistically significant. The MDL for  $^{238}\text{U}$  was approximately 18 pCi/g.

The plots of the repeat logs demonstrate reasonable repeatability of the SGLS data for the natural radionuclides at energy levels of 609, 1461, 1764, and 2614 keV. The rerun of the neutron-moisture tool showed good repeatability.

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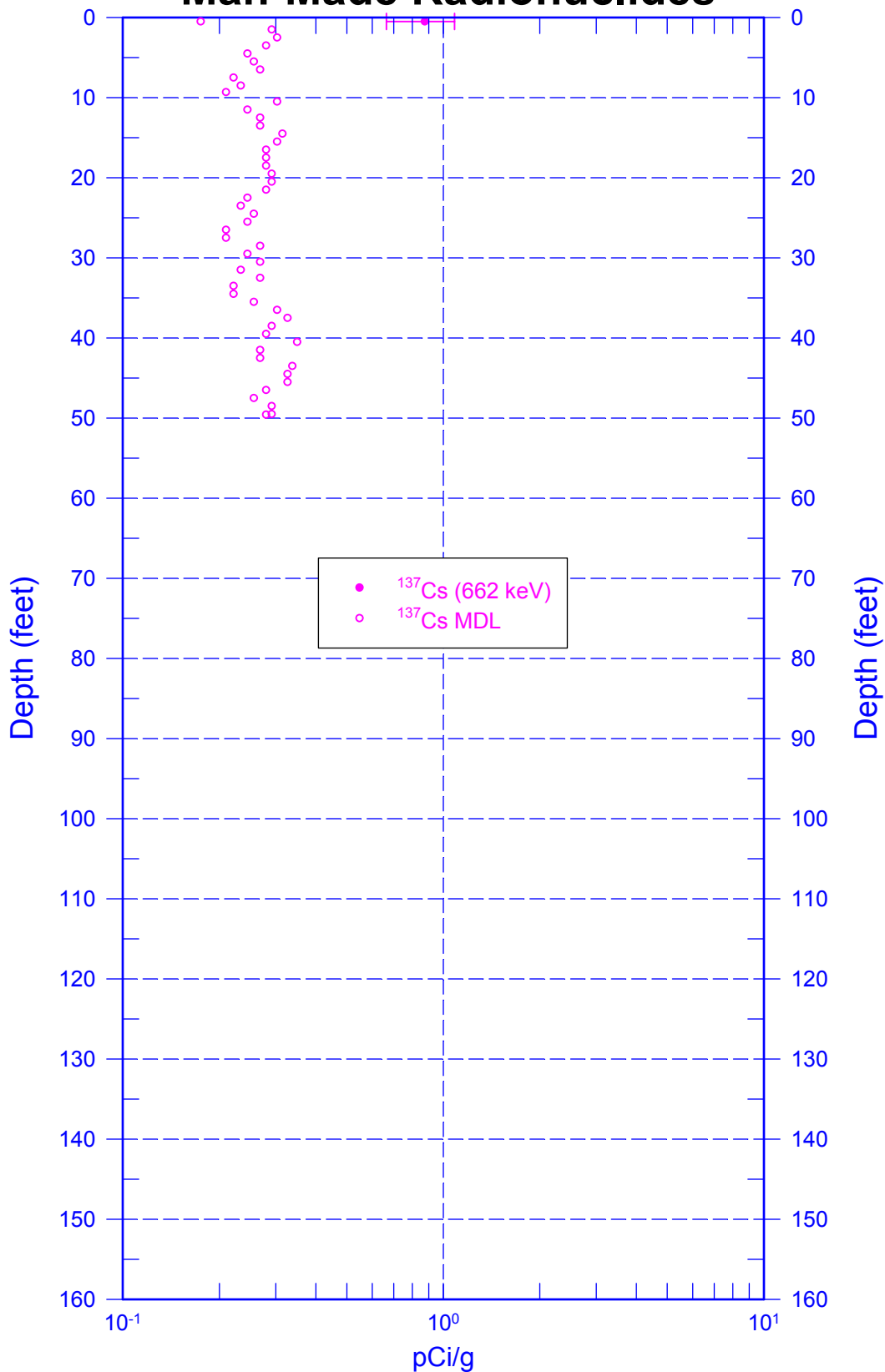
<sup>1</sup> GWL – groundwater level

<sup>2</sup> TOC – top of casing

<sup>3</sup> N/A – not applicable

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## Man-Made Radionuclides

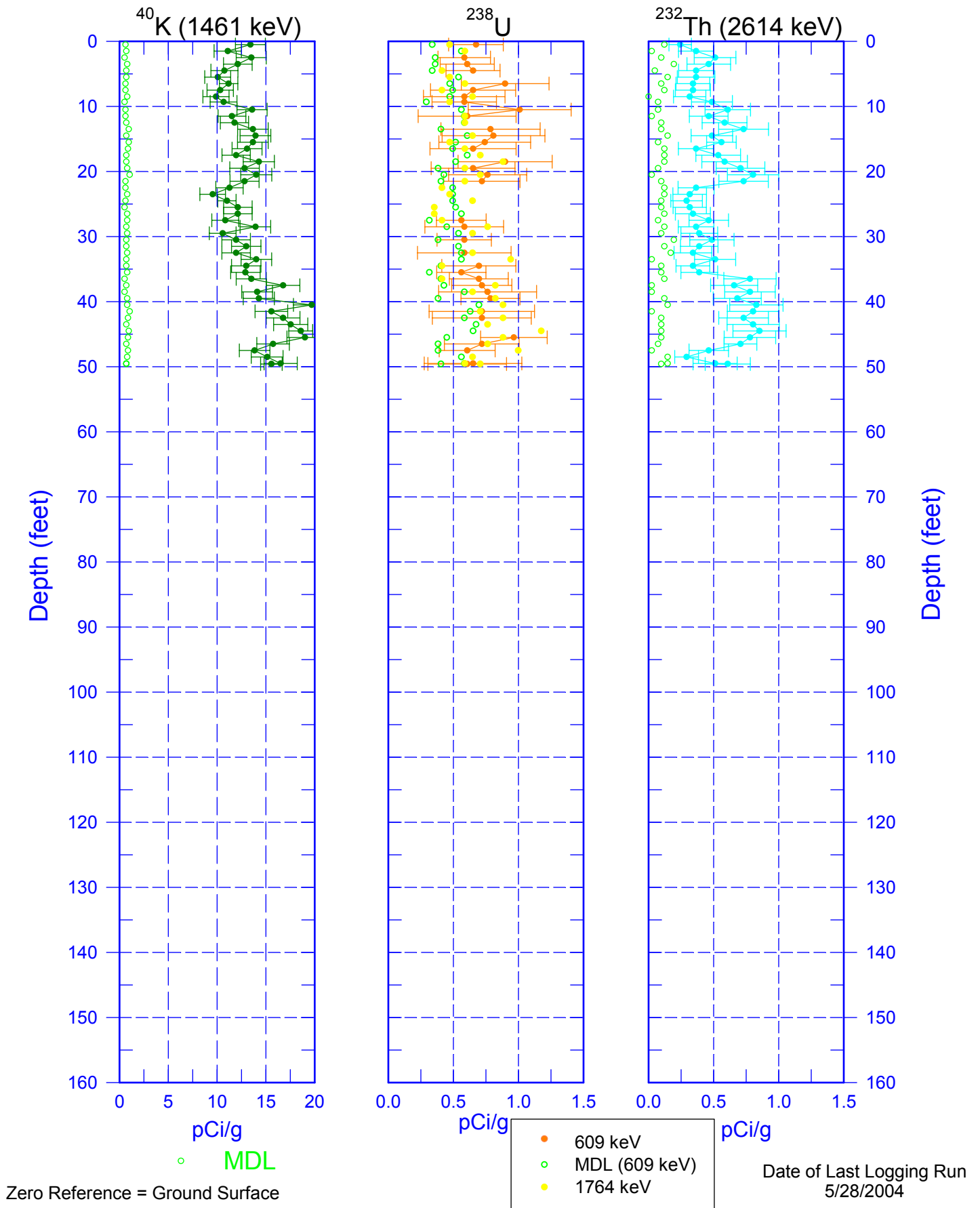


Zero Reference = Ground Surface

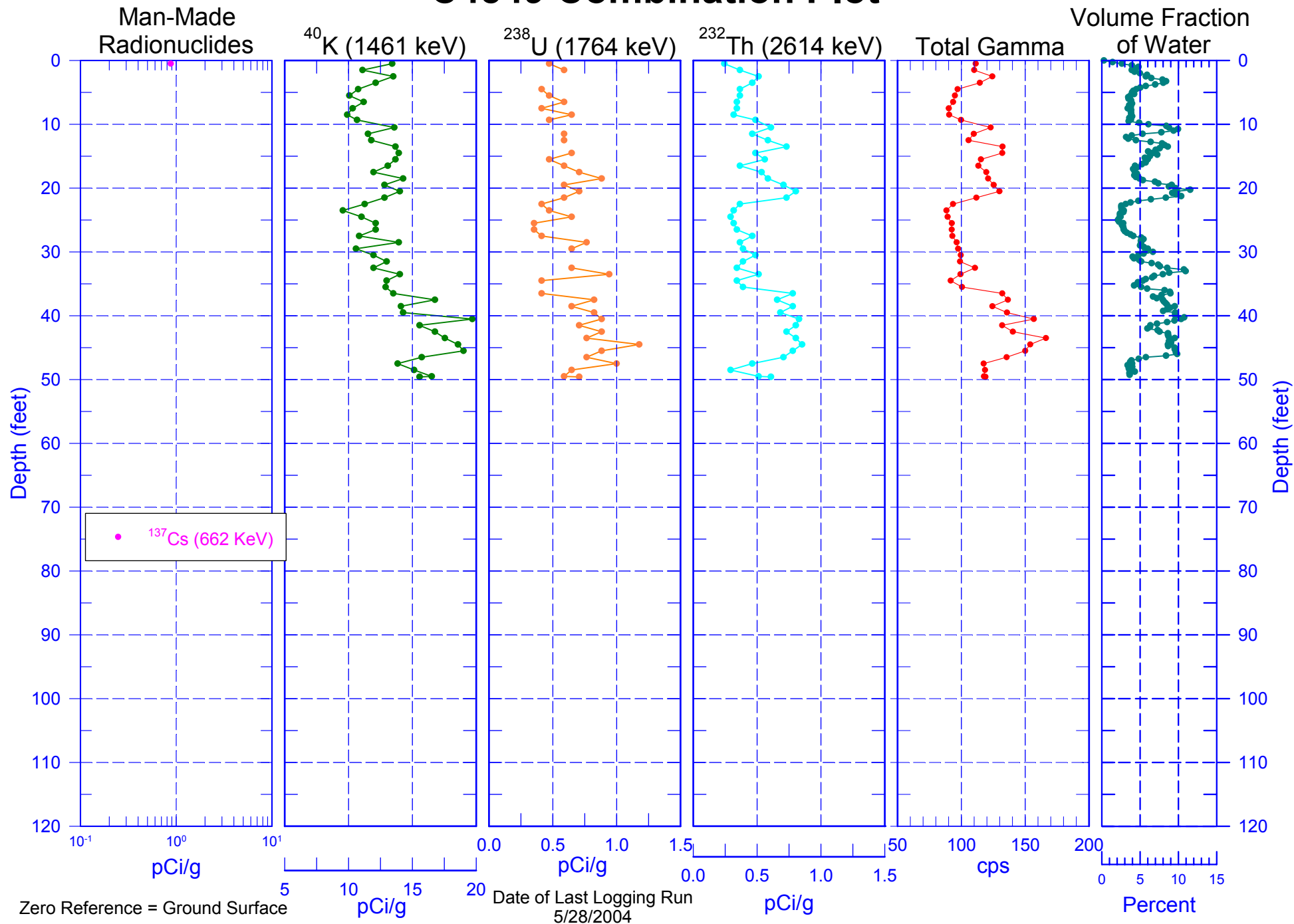
Date of Last Logging Run  
5/28/2004

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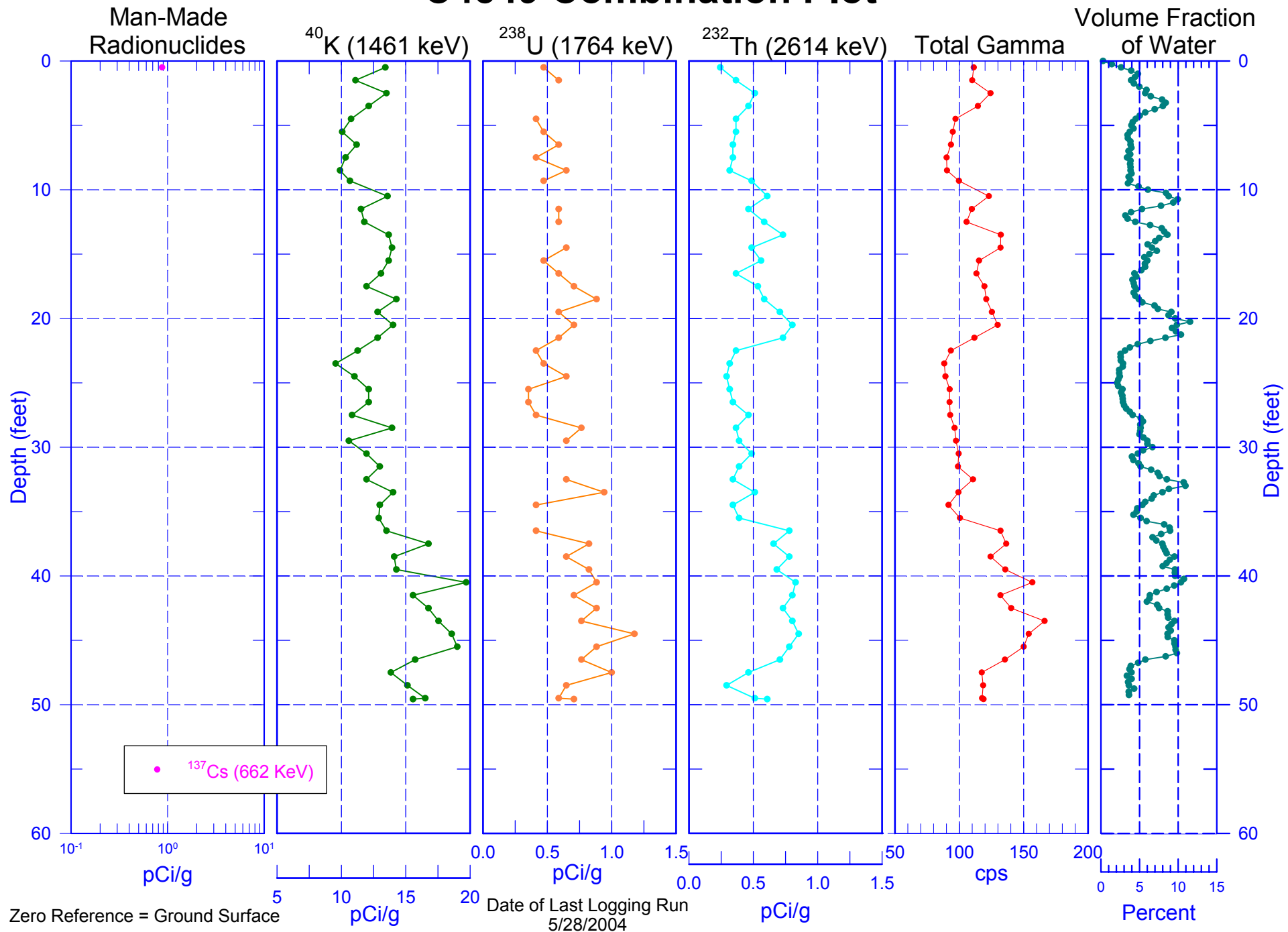
## Natural Gamma Logs



# C4549 Combination Plot

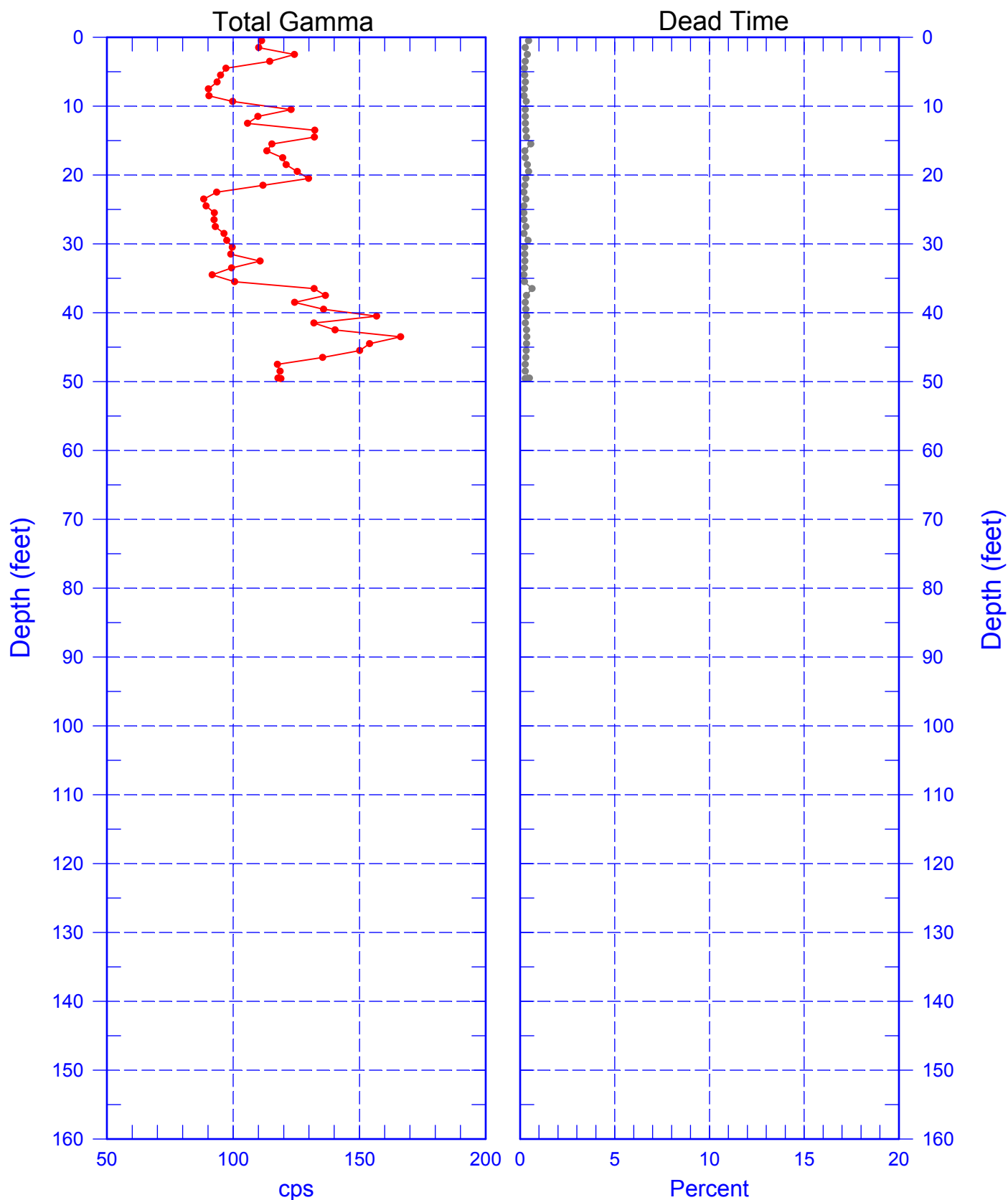


# C4549 Combination Plot



# C4549

## Total Gamma & Dead Time

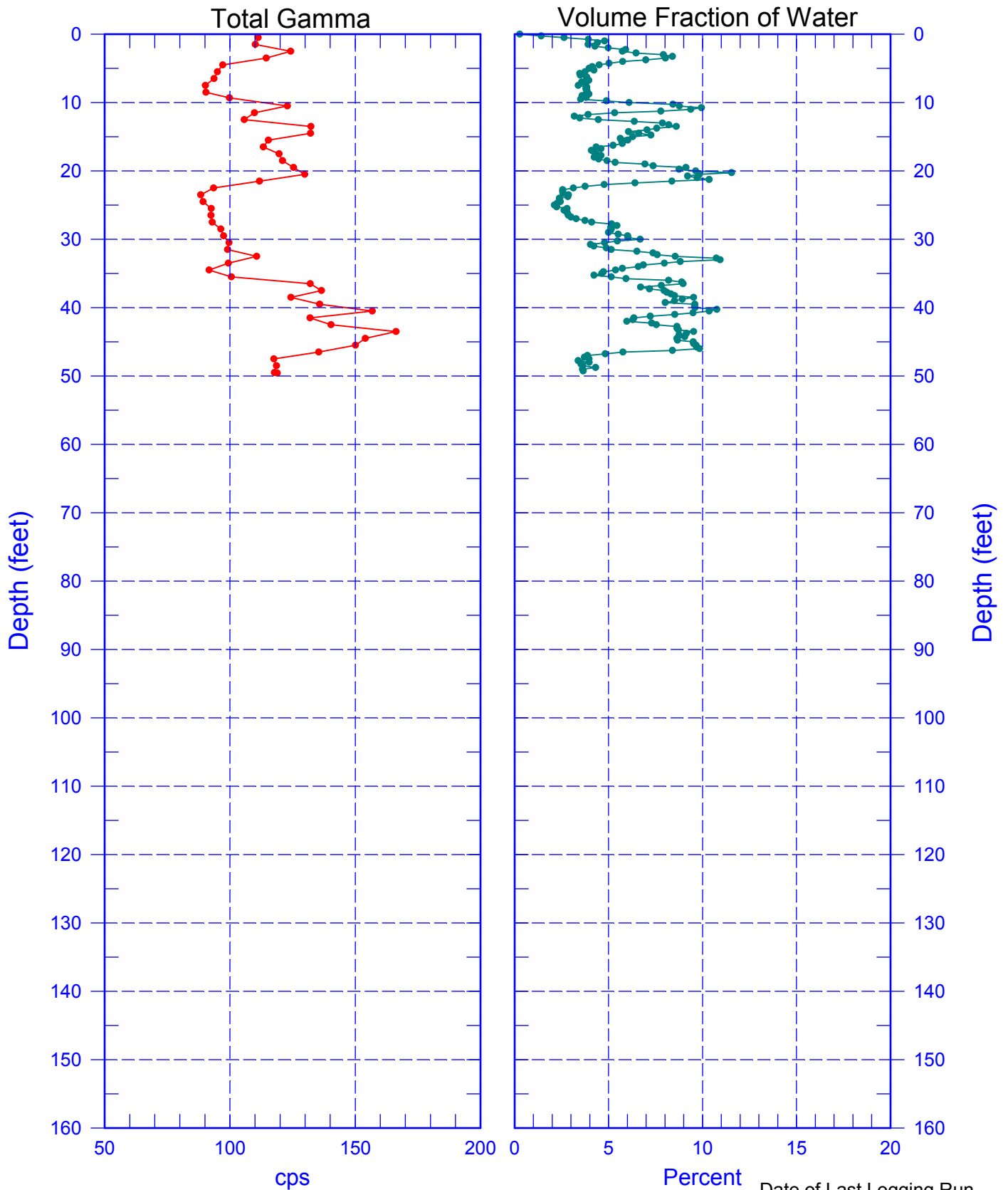


Zero Reference = Ground Surface  
Date of Last Logging Run  
5/28/2004



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## Total Gamma & Neutron

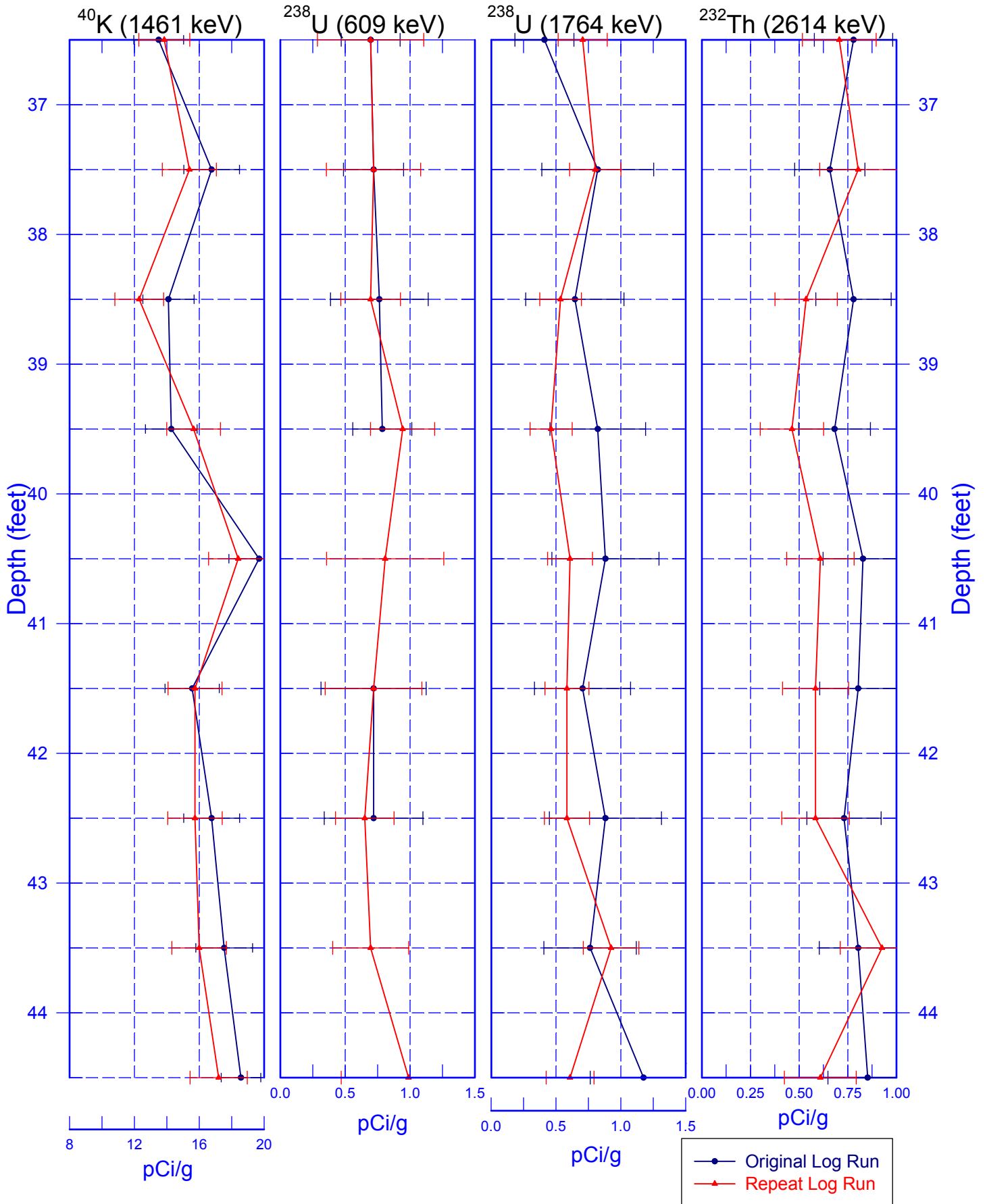


Date of Last Logging Run  
5/28/2004

Zero Reference = Ground Surface

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## Rerun of Natural Gamma Logs (44.5 to 36.5 ft)



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## Volume Fraction of Water Rerun

